

Chapter 2

Ecological Factors Associated with Port-Orford-Cedar

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Introduction

Port-Orford-cedar is found from southwestern Oregon to northwestern California, primarily in the Coast Ranges and Siskiyou and Klamath Mountains, with a small disjunct population in the Scott Mountains of California (fig. 2.1).

Although it has a narrow geographic distribution, it occupies many different environments. It is found at elevations from sea level to 6,400 feet. It may be found in glacial basins, along stream sides, on terraces, and on mountain side-slopes from lower to upper one-third slope positions. Soils where Port-Orford-cedar is found are derived from many parent materials, including sandstone, schist, phyllite, granite, diorite, gabbro, serpentine, peridotite, and volcanics. They are primarily Entisols, Inceptisols, Alfisols and Ultisols included in the mesic and frigid temperature regimes. Port-Orford-cedar shows adaptability to a wide range of summer evapo-transpiration stress, from very high humidities along the coast to very low summer humidities inland. The great ecological amplitude of Port-Orford-cedar is believed to reflect a geographic concentration of genetically based characteristics that developed in a larger geographic range that included parts of Idaho, Montana, California, Oregon, and extended as far east as Nebraska, 10 to 52 million years ago (Edwards 1983).

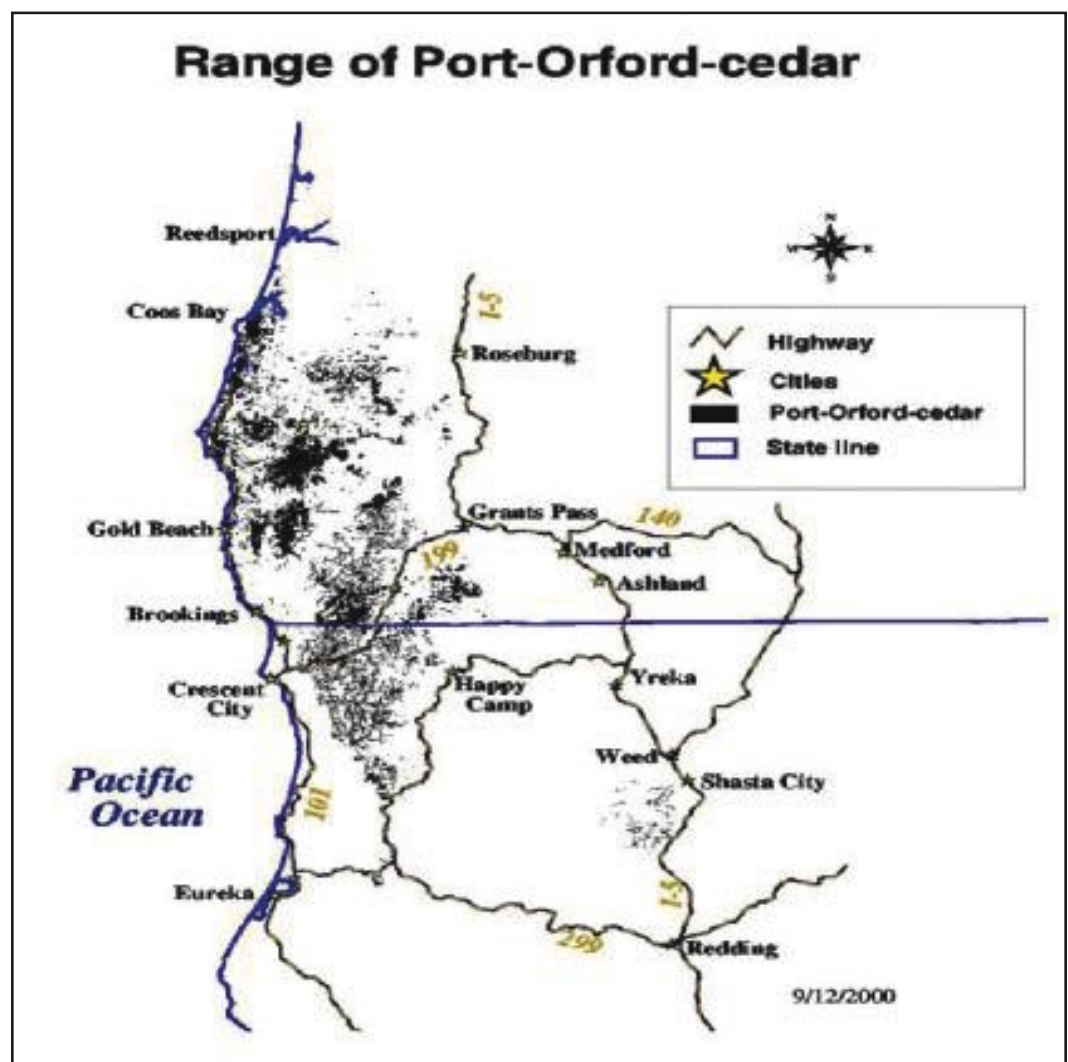


Figure 2.1—The native range of Port-Orford-cedar



Figure 2.2—The world's largest Port-Orford-cedar growing near Powers, Oregon



Figure 2.3—The world's largest Port-Orford-cedar growing near Powers, Oregon

Port-Orford-cedar plant associations characterize the broad range of habitats in which Port-Orford-cedar is found. These plant communities display some of the richest plant species diversity of all forest types in the region (Jimerson and Creasy 1991).

Port-Orford-cedar can be found with a variety of species with differing ecological requirements. These species change across the range of Port-Orford-cedar. For instance, in the northwestern portion of the range, Port-Orford-cedar is found in association with

western hemlock (*Tsuga heterophylla* [Raf.] Sarg.), in the southwest with coastal redwood (*Sequoia sempervirens* [D. Don] Endl.) and tanoak (*Lithocarpus densiflora* [H. & A.] Rehd.), in the central portion with Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco.), and at higher elevations in the eastern portion of its range with white fir (*Abies concolor* [Gord. & Glend.] Lindl.), western white pine (*Pinus monticola* Dougl.), Shasta red fir (*Abies magnifica* var. *shastensis*) and mountain hemlock (*Tsuga mertensiana* [Bong.] Carr.). Port-Orford-cedar has been noted as a component of more than 88 plant associations in Oregon and California (Atzet et al. 1996, Jimerson and Daniel 1994, Jimerson et al. 1995, Jimerson et al. 1996, Jimerson and Creasy 1997, Jimerson et al. 2000).

The wide ecological amplitude of Port-Orford-cedar is also reflected in the climatic diversity of the ecoregions and subsections in which it is distributed. These ecological units are defined based on biotic and environmental factors that directly affect ecosystem function (McNab and Avers 1994).

Distribution

Overall, the ecological units with unique plant associations are in the cooler, wetter (more northern) environments (Mid-Coastal Sedimentary and Southern Oregon Coastal Mountains), the inland (Inland Siskiyou/Siskiyou Mountains) or inland, high elevation environments (Upper Scotts Mountains). Gradient analyses showed different environmental variables were important in describing the distribution of Port-Orford-cedar between the different ecoregions and subsections (table 2.1).

Table 2.1—Important variables in gradient analyses which describe the distribution of Port-Orford-cedar by ecoregion and subsection¹

Ecoregion/Subsection	Axis 1 Variable	Axis 2 Variable
Northern Coast		
Mid-Coastal Sedimentary	Ultramafic parent material	
Southern Oregon Coastal	Elevation	
North Inland		
Inland Siskiyou	Elevation	Metamorphic rock
Siskiyou Mountains	Macroposition	Microposition
Mid-Coast		
Coastal Siskiyou	Ultramafic parent material	Surface coarse fragments
	Surface coarse fragments	Mean annual temperature
Mid-Range		
Serpentine Siskiyou	Distance to ocean	Elevation
Gasquet Mountain Ultramafics	Surface rock	
	Ultramafic parent material	
Western Jurassic	Ultramafic parent material	
	Macroposition	
East Disjunct California		
Eastern Klamath Mountains	Elevation	Aspect
Lower Scott Mountains	Moisture stress	Direct solar radiation
Upper Scott Mountains	Mean annual temperature	
	Microposition	
Southern Range		
Eastern Franciscan	Not analyzed	
Pelletreau Ridge	Precipitation	Elevation
Rattlesnake Creek	Moisture stress	Microposition
	Metamorphic parent material	
	Ultramafics	

¹Jimerson, T.M. 1999. Personal communication. Ecologist, Six Rivers National Forest, 1330 Bayshore Way, Eureka, CA 95501.

Two types of ecological units were used to describe the distribution of Port-Orford-cedar, level IV ecoregions in Oregon (USEPA 1998) and subsections in California (Miles and Goudey 1997). The ecological subsections are the lowest division of regional ecosystems mapped in California and the level IV ecoregions are the lowest division of ecoregions mapped in Oregon. Ecoregions and subsections are configured and delineated differently because they are based on two different methods of mapping ecosystems. The main difference between these two approaches is that land use or human disturbance is used as a factor in separating ecoregions, while subsections are separated by differences in management prescriptions. The ecoregions and subsections are shown in figure 2.4 and characterized in table 2.2.

Ecoregion and Subsection Descriptions

Northern Coast

The Mid-Coastal Sedimentary and Southern Oregon Coastal Mountains—These ecoregions are part of the Oregon Coast Range. This is an area of low mountains with high rainfall and dense coniferous forests. It has moderately sloping, dissected mountains and sinuous streams. The most important characteristic in terms of species composition is the occurrence of western hemlock as a dominant or codominant species. Ten plant associations with Port-Orford-cedar were identified in these ecoregions, and five were found only in these ecoregions.

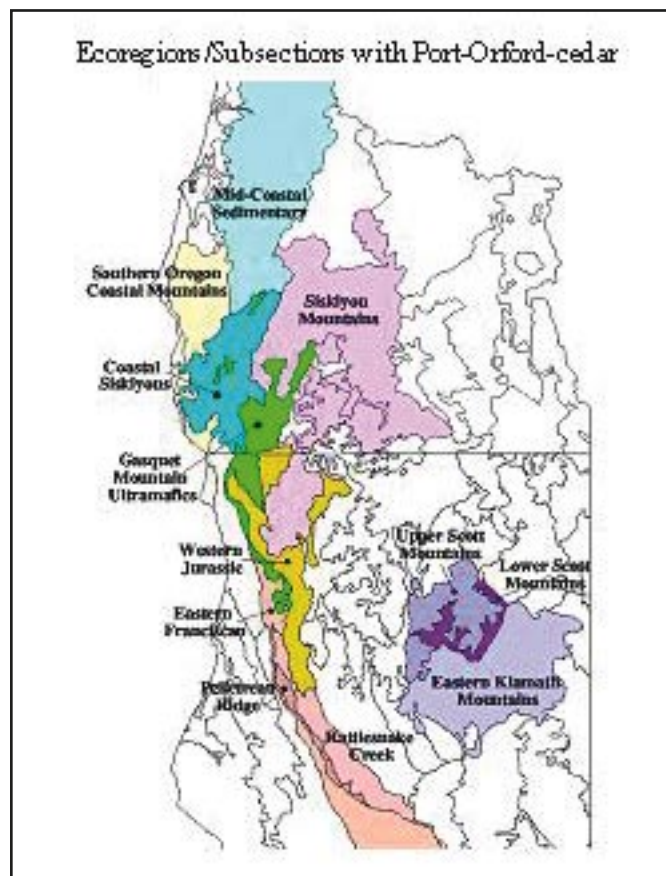


Figure 2.4—Ecoregions and subsections with Port-Orford-cedar occurrence

Table 2.2—Significant environmental factors affecting Port-Orford-cedar by ecoregion/subsection

Ecoregion/Subsection	Area (acres)	Elevation (feet)	Precipitation. (inches)	Distance to Ocean (miles)	Mean July Temp. (F.)	Mean Jan. Temp. (F.)	Predominant Parent Material
Mid-Coastal Sedimentary	2,303,227	300-2000	60-130	3-45	48-78	32-48	siltstone sandstone
Southern Oregon Coastal Mountains	443,116	0-3400	70-140	0-28	52-76	36-52	complex
Coastal Siskiyou	545,604	1000-4800	70-140	7-30	50-76	38-50	conglomerate w/ sandstone
Eastern Franciscan Serpentine Siskiyou/ Gasquet Mountain Ultramafics	1,251,951 400,980	1200-8092 200-4800	40-120 45-140	data gap 6-45	55 57	35 46	metaclastic rocks ultramafic
Western Jurassic	data gap	250-4000	50-120	7-45	57	45	ultramafic sedimentary
Inland Siskiyou/ Siskiyou Mountains	1,862,497	1000-7309	35-100	13-57	53	40	metasedimentary peridotite granitics
Pelletreau Ridge	73,915	1500-5000	60-80	20-25	54	45	sedimentary
Rattlesnake Creek	312,703	400-5881	40-60	20-25	57	45	metavolcanic
Eastern Klamath	data gap	1950-3000	70	84	56	42	metavolcanic metasedimentary
Lower Scott Mountains	127,297	1500-5000	40-60	60-90	55	45	ultramafic granitic
Upper Scott Mountains	389,795	4000-9025	30-70	60-90	45	30	ultramafic granitic

North Inland

Inland Siskiyou and Siskiyou Mountains—This ecoregion and subsection has higher, steeper terrain than the other ecoregions and subsections. It has a high diversity of conditions, which is reflected in the vegetation. The vegetation is dominated by the Douglas-fir Series at low elevations, Jeffrey Pine Series on ultramafic soils, and White Fir and Red Fir Series at higher elevations. Sixty-two plant associations containing Port-Orford-cedar were identified in this ecoregion and subsection, and many are exclusive or have their greatest extent here.

Mid-Coast

The Coastal Siskiyou—The Coastal Siskiyou Ecoregion is located in Oregon and is an area with highly dissected mountains and high gradient streams, as well as a few, small, alpine glacial lakes. The climate is wetter with more maritime influence than elsewhere in the Klamath Mountains bioregion. This area has tanoak, Douglas-fir, and some Port-Orford-cedar. Western hemlock is not a dominant overstory species. Nine plant associations were identified in this ecoregion that contain Port-Orford-cedar, with a high frequency of plant associations on serpentine soils.

Mid-Range

The Serpentine Siskiyou/Gasquet Mountain Ultramafics—This ecoregion and subsection is dominated by the Tanoak-Port-Orford-cedar Subseries (Port-Orford-cedar is codominant with tanoak). In Oregon, the White Fir Series and the Port-Orford-cedar-White Fir Subseries are fairly common and occur at relatively high elevations (up to 4800 feet) and a long distance inland (up to 45 miles). The Port-Orford-cedar-Douglas-fir and Port-Orford-cedar-Western White Pine Subseries are more common in California, the latter being correlated with ultramafic rock.

The Western Jurassic—Marine air moderates temperatures in the western portion of this subsection creating a temperate to humid climate. The Douglas-fir and Tanoak Series dominate this subsection. Twenty-two plant associations containing Port-Orford-cedar are described in this subsection, none are found only here. This subsection has the second highest amount of Port-Orford-cedar of all subsections in Northern California.

East Disjunct California

Eastern Klamath Mountains—This subsection is located on the farthest southeastern corner of the Klamath Mountains. It has two plant associations with Port-Orford-cedar; neither is unique to this subsection.

Lower Scott Mountains—This subsection comprises the low elevation portion of the Eastern Klamath geologic belt of the Klamath Mountains. Ultramafic rocks of the Trinity Terrane and intrusions of granitic rocks dominate the geology of this area. The Jeffrey Pine, Ponderosa Pine, White Fir, and Douglas-fir Series are the dominant vegetation in this subsection. Five Port-Orford-cedar plant associations are present.

Upper Scott Mountains—This subsection comprises the high elevation portion of the Eastern Klamath geologic belt of the Klamath Mountains. The geology is the same as the Lower Scott Mountains Subsection. Thirteen plant associations with Port-Orford-cedar are found here, seven are unique to this subsection, and three additional Port-Orford-cedar plant associations are predominantly found here.

Southern Range

The Eastern Franciscan—The Eastern Franciscan Subsection represents the high elevation portion of the northern California Coast Ranges. There are 16 Port-Orford-cedar plant associations in this subsection. None of the plant associations are unique to the subsection, and most are extensions of what is found in the Gasquet Mountain Ultramafics, Western Jurassic, and Siskiyou Mountain subsections.

Pelletreau Ridge—This subsection is a narrow, arcuate strip of land along the southwest edge of the Klamath Mountains. Port-Orford-cedar stands here are 20 miles south and 50 miles west of the nearest other stands of Port-Orford-cedar, although there are no unique plant associations here. The vegetation in this region is dominated by Douglas-fir and Tanoak Series, with White Fir Series at higher elevations (Miles and Goudey 1997).

Rattlesnake Creek—This is also an arcuate subsection that is within the Western Paleozoic and Triassic belts of the Klamath Mountains. The Douglas-fir, White Fir, and Ponderosa Pine Series dominate this subsection, with Jeffrey Pine Series on serpentinized peridotite (Miles and Goudey 1997). This subsection has a very small amount of Port-Orford-cedar. There are no Port-Orford-cedar plant associations that are unique or reach their greatest extent here.